JUN 1 1929

SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

A SCIENCE SERVICE PUBLICATION

$5 a year 15c a copy June 1, 1929

HE MAKES A GOOD WIFE

Father Surf Bird Hatches the Eggs

(*See page* 339)

Vol. XV No. 425

New Strategy in the T. B. Campaign

Therapeutics

By Edwin E. Slosson

The turning point in the Great War was when the allied forces fighting the Germans joined in a single coordinated plan of campaign under unified control by the appointment of General Foch, as commander-in-chief of all the armies. The turning point in a greater war may likewise date from the day when the allied forces fighting the germ of tuberculosis joined in a single coordinated plan of campaign under unified control in charge of the Research Committee of the National Tuberculosis Association. This means a revolution of the major strategy in the conquest of disease, the adoption of the policy of siege tactics and trench warfare on a large scale instead of relying upon accidental advances and the casual attacks of individual investigators as in former times. Progress under the new plan may be slow but is sure, for each foot of ground gained in advances into unknown territory is securely held. A small army of experts has volunteered service in this field—chemists, bacteriologists, druggists, physiologists and physicians, more than a hundred of them, working in various parts of the country on the common problem.

The first objective of the new campaign is the discovery of the cause of the disease. After that is attained the way will be opened for the discovery of a cure for the disease. It has long been known that tuberculosis is due to certain plant-like parasites, bacilli, or in plain English "little rods," which find a lodgment in the cells in the lungs or other parts of the body and there form nests or colonies, in the shape of little nodules, the characteristic "tubercles." But we have got to know more about these bacilli before we can fight them effectively. How does it happen that these little creatures have the power to pull down a strong young man? Why is it that a little local colony of these microscopic invaders can set up fevers and sweats in the entire frame and cause him to weaken and waste away? Do they poison him or what? Do the dead germs or the live ones do the damage? What are they made of? What do they give off while living? What do they leave when dead?

Obviously the first step in the investigation was to set the chemists to analyzing the T. B. bugs. But the chemists demanded that they be supplied with the material to be analyzed by the pound, even by the hundred pounds in the long run. So two of the leading manufacturers of medicines undertook to cultivate the creatures they proposed to destroy. Fortunately it was found that the tuberculosis bacillus, unlike many microbes, could be made to grow outside of animals and without any animal matter. They would thrive in glass flasks filled with nutrients of known composition, made up of pure chemicals. Consequently any new substances discovered in the dead and dried germs, or in the solutions where they had lived, must be such as have been formed by the creatures themselves and such as they release inside the body. In this mass of crude material then we may expect to find the products that exert the deleterious effect upon the human system.

Although the chemical work may be said barely to have begun, yet it has already resulted in startling discoveries. Two, especially, are altogether unexpected and without precedent. There has been found, among the toxic constituents of the T. B. germs, two that belong to two of our most familiar food families; an unknown fat that may form tubercles and an unknown sugar that may be fatal under certain circumstances. All the fats and sugars known hitherto are nutritious and innocuous. Not a disreputable member among the scores of fats and sugars found in nature or the hundreds that can be formed by the chemist.

But the newly found fat when injected into an animal will form the same sort of tubercles as are produced by the living germs. This fat is, of course, devoid of life; in fact has been freed from all other substances in the complicated process of purification. Probably when its structure has been worked out it will be found possible to make it artificially from mineral matter in the laboratory. It contains the same elements as the common fats and it seems similar in constitution to the ordinary fatty acids of foods, such, for instance, as stearic acid. Yet it is capable of producing all by itself the same little nodules that are characteristic of the disease and have hitherto been found only in the colonies of the living bacilli. The first effect of the injection of this fatty fraction is to stimulate the growth of the particular kind of blood cells that the T. B. bug lives in, and the abnormal multiplication of these cells upsets the balance of the body cells.

The other discovery is still more unexpected. This is a strange sugar which, when injected into the blood of a tuberculous animal, will kill it quickly. Yet it is harmless to an uninfected animal. Somehow the sugar knows. It can make a diagnosis like a doctor—or better than some. Yet the sugar is a white, harmless looking powder, sort of sweetish like the others, made of the same elements, so it is peculiar that it should prove to have poisonous properties. It seems to act directly on the adrenal glands, causing sweats and fevers, for (*Turn to next page*)

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Science News-Letter, The Weekly Summary of Current Science. Published by Science Service, Inc., the Institution for the Popularization of Science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science.

Edited by Watson Davis.

Publication Office, 1918 Harford Ave., Baltimore, Md. Editorial and Executive Office, 21st and B Sts., N. W., Washington, D. C. Address all communications to Washington, D. C. Cable address: Scienserve, Washington.

Entered as second class matter October 1, 1926, at the postoffice at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

Subscription rate—$5.00 a year postpaid. 15 cents a copy. Ten or more copies to same address, 5 cents a copy. Special reduced subscription rates are available to members of the American Association for the Advancement of Science.

Advertising rates furnished on application.

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Toxic Sugar is Tuberculosis Poison

Pathology

The world's first poisonous sugar has been discovered lurking within the tuberculosis germ. Although it is harmless to uninfected animals it is death to those suffering from tuberculosis. Produced by the tubercle bacillus itself it is probably the stuff that slowly poisons the victim of the white plague.

Such is the latest news from a great cooperative research effort directed at a greater knowledge of the disease and an eventual use of this knowledge in saving human lives. To the National Tuberculosis Association meeting at Atlantic City last Tuesday, Dr. William C. White, of the Hygienic Laboratory of the U. S. Public Health Service at Washington, brought his test results that showed the deadliness of the new polysaccharide isolated from tuberculosis germs by Dr. R. J. Anderson, Yale chemist.

Never before in medical or chemical history has a sugar been shown to be poisonous. But a small amount of this white, innocent looking sweetish substance injected into a tuberculous animal causes its death in four to five hours. A well animal similarly treated shivers, then runs a temperature, its white blood cells decrease, showing that the sugar has some effect on the healthy body even if the consequences are not tragic.

This is the second startling discovery in the course of cooperative research by twenty-one organizations and dozens of scientists under the general directions of the National Tuberculosis Association. Last month Dr. Florence R. Sabin of the Rockefeller Institute for Medical Research, New York City, revealed that a germ-free fat, obtained from chemical analysis of the tuberculosis germ and similar in composition to food fats, will cause the characteristic tubercles of the disease. This inaugurated a new technique in disease study.

As a necessary preliminary to these discoveries of new roles for sugar and fat, Profs. Treat B. Johnson and R. J. Anderson at Yale undertook large scale chemical separations of bacteria into their component compounds. H. K. Mulford Company and Parke, Davis and Company grew many pounds of various sorts of tubercle bacilli under rigorous conditions to supply the raw materials for the separations.

Out of these researches there may arise a new conception of life itself. It may prove that sugar is the basic life material. Heretofore fats and proteins have been considered the most characteristic substances that enter into living matter. Sugar seemed to enter into the composition of living things somewhat incidentally.

But these researches upon tuberculosis show that even the various strains of tuberculosis germs have their own, radically different sugars. The avian bacillus yields a sugar chemically and physiologically unlike that in the human or bovine sort. Recent research upon the sugars contained in the germs causing pneumonia, the pneumococci, shows that each germ of this group has its own sort of sweet.

So there is beginning to be built a new theory of the chemical nature of life, founded on sugar specificity. Even the green leaf of the growing plant in which the sunlight builds carbohydrates may have its secrets unlocked.

Other phases of the National Tuberculosis Association's cooperative attack on the fundamentals of the disease were discussed at the meeting during the past week. Among the organizations joining with the association in its attack are: U. S. Public Health Service; U. S. Bureau of Animal Industry; National Research Council; American Sanatorium Association; Henry Phipps Institute, Philadelphia; Edward L. Trudeau Foundation, Saranac Lake; Rockefeller Institute for Medical Research; University of California; University of Cincinnati; University of Chicago; Cornell University Medical School; Johns Hopkins University; University of Nebraska; University of Pennsylvania; Vanderbilt University; University of Wisconsin; Yale University; H. K. Mulford Company; Parke, Davis and Company.

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New Strategy in the T. B. Campaign—*Continued*

the secretion of the adrenals controls the temperature reactions of the body. We may surmise in advance of evidence that the familiar symptoms of the disease and its final fatal effects may be due, in part at least, to the constant leaking into the blood of this pernicious product from the T. B. germs as they die and decompose inside the cells of the afflicted individual and so slowly poison him.

This is not the only case of sugar found in disease germs, for recently some unknown sugars have been extracted from pneumonia material.

The healthy person can for a time withstand the pernicious influences emanating from the infected area, but as these increase and his resistance weakens, he fails to react as at first and the rising and falling of his temperature becomes more extreme. We may hope that eventually the chemists will find something that will break down the waste poison of the tubercle bacilli into glucose or other harmless substances.

It is already obvious that the new tactics for the investigation of disease, while at first focussed upon the tuberculosis problem, will throw light upon other diseases and in fact upon the fundamental processes of human physiology. For the three grand classes of components found in these laboratory raised bacteria, that is, fats, sugars and proteins, are the same as constitute our bodies and our food. But how these three kinds of compounds combine in the body is still a mystery. The chemist has isolated and determined the composition and construction of all the common fats, sugars and proteins. Some of them he even can make synthetically in his laboratory. He can figure out closely just how much of these various ingredients of food are needed for a particular day's work. He can tell, for instance, just how many more foot-pounds a man can lift by adding an ounce of glucose to his ration. The chemist can trace the molecules of glucose through the blood stream until they get to the muscle where they are needed. But there he loses track of them. He is still much in the dark as to how the protein in the muscle fiber seizes on to the sugar and gets energy out of it and what part is played by the phosphorized fatty acids present. If he can find out how these three substances are hitched up in normal life, he would most likely be able to find out how they get hitched up wrongly in disease and finally how to correct the blunder.

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Darwin's House a Shrine

History of Science

The birthplace of evolution, the house at Down on the outskirts of London where Charles Darwin lived for almost forty years and wrote "Origin of Species," "Descent of Man," and other famous biological classics, is to open to visitors on June 7 as a shrine to his memory.

Under the guardianship of the British Association for the Advancement of Science and as a result of the generosity of George Buckston Browne, British surgeon, Down House was acquired from Prof. Charles Galton Darwin, grandson of the naturalist. Maintenance and preservation for all time is provided in the terms of the gift and it will be open to the public without charge.

Relics of Darwin will be deposited and exhibited there and naturalists throughout the world have been invited to contribute Darwiniana to this collection. The great naturalist's "old study" in which the "Origin of Species" was written is to be restored and furnished as it was when Darwin lived. The famous artist, John Collier, has been commissioned by the donor to paint replicas of his well-known portraits of Darwin and Huxley to be hung at Down House. Several leading American biologists, among them President Henry Fairfield Osborn of the American Museum of Natural History, are expected to send to the shrine letters and manuscripts relating to the theory of evolution as expounded by Darwin.

In the garden with its "thinking path," as Darwin called its sand walk; in the orchards and meadows and in the house itself, scientists of a new generation are expected to continue the work of evolutionary discovery. Combined with the memorial features of Down House its use for scientific research is contemplated.

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Are We Overspecialized?

Philosophy

DR. EDWIN G. CONKLIN in a letter to the American Philosophical Society:

"Indeed, the danger at the present time is that specialization has so far outrun integration that we may have approached the danger point where knowledge, science or society will break up into smaller fragments and thus put an end to progress as a whole."

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No One Knew!

—how interesting was the Story of Philosophy until Dr. Durant told it; or what hidden romance lay in the Outline of History until Mr. Well's masterful presentation. Now comes a book of similar sort, which tells a story closer to every-day human living than either of these, more direct in its appeal—the sort of book which belongs in the private library of every person with a claim to culture. It is *Edward B. Vedder's*

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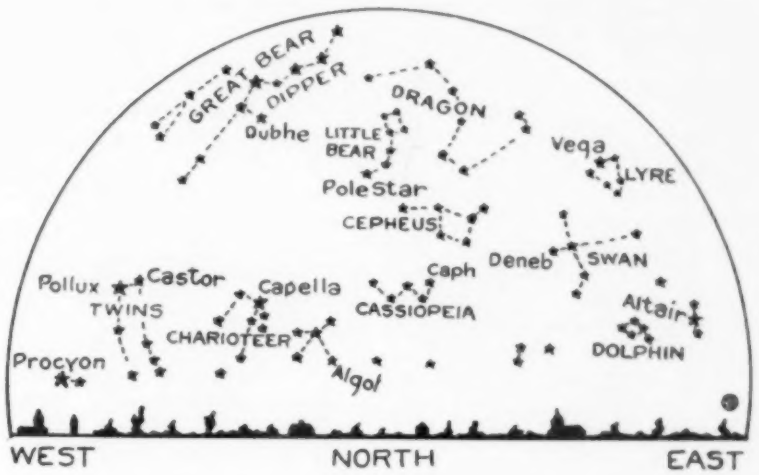
Blinking Stars Show Size of Universe

Astronomy

By James Stokley

In the evening sky now, and in the coming months, is one of the most famous of the astronomer's measuring sticks.

Look to the north sky. Low down is the W-shaped constellation of Cassiopeia. Above it, and a little to the right, is a somewhat distorted square of rather faint stars. Attached to the left side of the square is a triangle, formed partly of the two stars on the left side of the square. The lowest star in the square is known to astronomers as delta Cephei, and though it is not very bright, not bright enough to have a special name of its own, like Sirius or Betelgeuse, it is one of the most famous stars in the sky.



If you were to watch delta Cephei night after night, with a telescope equipped with a photometer to measure its brilliance, you would find that it is not constant. At one time you would find it is as bright as the 3.7 magnitude, then it fades away to the 4.6 magnitude. After 5.37 days have passed, it is again at magnitude 3.7, and so keeps up this regular variation.

Variable stars are not uncommon. In fact, there is a large body of amateur astronomers, the American Association of Variable Star Observers, that constantly keeps track of these celestial flashing signs. Variable star observation is one branch of astronomy where quantity is the important thing, even at the sacrifice of quality, or high precision. A large number of rather rough estimates of the brightness of these stars at various times is just as important as extremely accurate measurements of a smaller number.

But variable stars have different characteristics. Some vary regularly, up, then down, at the same rate. Some are irregular, and show variations in the time taken for the recurrence of maximum brightness. Delta Cephei, however, takes a day and a half to change from its minimum to maximum brightness, and the rest of the time, about three and three-fourths days, to return to minimum.

A number of stars that have the same characteristics as delta Cephei, not only in the way the brightness changes, but in numerous other respects, are known to the astronomers. As a class they are called Cepheid variables, after the type specimen.

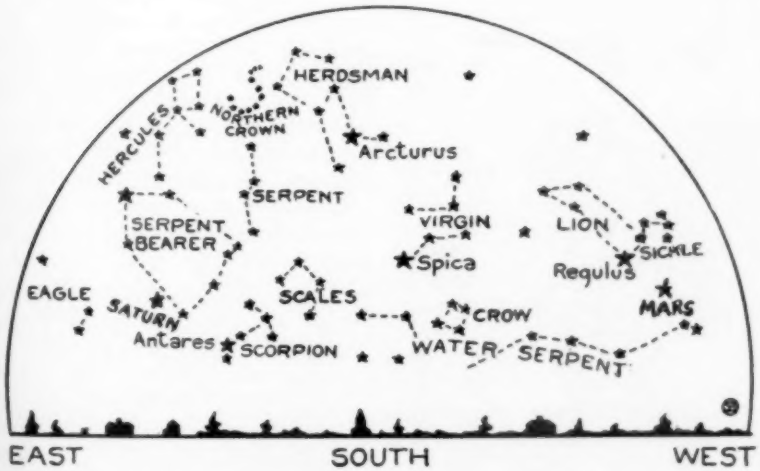
Just what causes this peculiar variation of the Cepheid is still unknown, but the most acceptable explanation seems to be one first suggested by Dr. Harlow Shapley, the distinguished director of the Harvard College Observatory, and later developed mathematically by the famous English astronomer, Prof. A. S. Eddington, of Cambridge. This is that the Cepheids are pulsating stars.

On a dark body, like the earth, the most important force that we are familiar with is that of gravitation. In a large and brilliant body like the sun, or a star, however, there are two others—the pressure outwards of the light from the star's interior and of the glowing gases of which it consists. In the normal star, the forces are equal and in opposite directions, so they balance and the star is in equilibrium.

Suppose, however, that something happens to compress the star a little. The force of gravitation would be greater, but the compression would heat the gases. The gas pressure would increase even more than the gravitational force, inwards, and so the star would expand to its original size. Inertia, however, would carry it past the point of equilibrium and then gravitation would again come into play and pull it back. In this way a series of pulsations would be set up that might continue indefinitely.

It was another Harvard astronomer, the late Miss Leavitt, who studied a group of some 1800 Cepheids in the southern sky in the Magellanic clouds. They are all presumably at about the same distance. Yet she found that they were, on the average, of quite different brightness, and that the brighter they were, the faster was the period in which they varied.

Dr. Shapley (*Turn to next page*)



HOLD THESE MAPS in front of you and face North or South. The upper or lower one will then show the stars of the June evening sky

Germless Island in Polar Seas

Bacteriology

Found: the magic land where you cannot get ill. At least this fairy country is absolutely germ-free. It is well known that almost all diseases are caused by germs. On the northern island of Novaya Zemlya, you would run very slim chances to be knocked down with some disease.

Dr. A. F. Kazansky, a scientist of the Central Geophysical Observatory at Leningrad, is responsible for the discovery. Polar explorers had many times noted the remarkable purity of polar air. Accurate tests were lacking, however. So, when Dr. Kazansky went to spend a winter at the Soviet Geophysical Station, Matochkin Shar, on the lonely polar island, Novaya Zemlya, he was prepared to make the tests. The results he obtained were almost startling. Microbes were not to be found on this enchanted island. No matter what Dr. Kazansky tested—air, earth, water, dust, not a germ could be discovered. Even wild game shot by hunters were germ-free. Such exceptional purity is considered to be a record.

Many different ingenious tests were tried out in the attempt to hunt down some germs. Sterile dishes with an agar-agar jelly especially suitable for bacterial growth were left outdoors for several hours at a stretch. Then the dishes were placed in an incubator and warmed, to stimulate the germ life. In no cases were any microbe colonies found. Just for comparison it may be sai l that a similar dish with jelly, exposed for 15 minutes to city air, would grow over with germ colonies too numerous to count.

Another highly spectacular test conducted by Dr. Kazansky was as follows: Fresh juicy meat in an open glass jar was left out-doors, where air, dust and rain could reach it. For eight months it was exposed to the elements. Yet when Dr. Kazansky examined the meat again, no trace of rotting was found. The meat was as fresh as when packed in the jar, almost a year ago.

It is supposed that the exceptional purity of air on Novaya Zemlya may prove a great attraction to sanatoria. Many pulmonary patients, being very weak and an easy prey to infection, require pure fresh air. Polar sanatoria may prove to be ideal for them.

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Blinking Stars and Size of Universe—*Continued*

then worked this into what is now called the Leavitt-Shapley law, by which the brightness of a Cepheid may be found by simply measuring the time it takes to change in brightness, and this has proved a powerful measuring stick for astronomers, as any object containing Cepheids can be measured for distance.

Very recently the Cepheids have proved their usefulness in a somewhat different way. This time they have gauged the diameter of space itself.

Write the number 176 and after it put a row of 18 ciphers. Then you will have the number of miles that you will have to travel if you want to completely encircle the universe and get back where you started!

Vast as this figure appears, it is about a twentieth as large as scientists supposed a few years ago. It is based on a new value of the "radius of curvature of spacetime", as the astronomer calls it, that was announced by Dr. Ludwik Silberstein. Dr. Silberstein is a mathematician physicist connected with the research laboratory of the Eastman Kodak Company, and is considered as one of the world's leading authorities on these matters, which are closely connected with Einstein's theories.

According to Einstein and his school space is not infinite. The old idea that one could travel in a straight line forever is wrong, they say. As a matter of fact, there is no such thing as a straight line, and if a person should travel far enough and long enough in what seems to be a straight line, he would eventually find himself back at his starting point.

Yet, they also say, space is unlimited, and this is an illustration of how that may be. If a small insect lived on the surface of the globe and was unable to leave it, or to perceive anything else off its surface, he could travel indefinitely around it in any direction. He would never come to an end, yet his universe would be limited. Even if endowed with human intelligence, and he or his ancestors had never been able to perceive anything off the globe's surface, he would not be aware of the rest of the world about him.

Our universe, say the relativists, is similarly curved, in some fourth dimension, which the human race has so far been unable to perceive or comprehend. Apparently, we are free to move in any direction we choose, but actually there is at least one direction in which we cannot move, since we cannot comprehend it. If we could, then we could move in that direction.

But even though it cannot be comprehended, the scientist can get some faint glimmering of its existence, and estimate the size of this four-dimensional sphere in which we live. This is what Dr. Silberstein has done.

Using data pertaining to two separate groups of Cepheids, furnished by the Harvard College Observatory, Dr. Silberstein has made a new estimate of the radius of curvature of the universe, or "spacetime" as it is generally called. This radius is practically the same when calculated from a group of another kind of stars. It is about a wentieth as large as a previous estimate that he made in 1924, which was based on 18 globular star clusters and the Magellanic Clouds. The latter are clouds of stars seen in the southern hemisphere of the sky. Dr. Harlow Shapley is now working out some new material on these objects. Though not finished, it appears that his previous estimate of their distances, which Dr. Silberstein used, was too large. Therefore, and for other weighty reasons, Dr. Silberstein believes that his new determination of the radius is the more accurate.

The maps show the June evening skies. Two planets are now with us. In the western sky after sunset is Mars, rather faint, but recognizable by its steady red light. In the southeast is Saturn, fairly bright, and of a steady leaden color. Through even a small telescope, Saturn is one of the most remarkable sights in the heavens, for it is provided with a unique system of rings. A telescope magnifying perhaps fifty times will show these rings, and also the brightest of the moons that revolve around the planet.

A welcome event occurs on Friday, June 21, at 4:53 p. m., Eastern Standard Time. At that moment the sun is directly over the Tropic of Cancer, in its farthest north position of the year. Then, according to the astronomer's reckoning, summer commences.

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The Father Bird Hatches the Egg

Ornithology

By MARJORIE MACDILL

Now that the feathered world is hard at work grappling with the high cost of worms and the knotty problems of family raising and housekeeping generally, the heyday of the naturalists' hunting season is in full swing. With everyone from Mr. and Mrs. Great Blue Heron to Father and Mother Chipping Sparrow intent on scratching out a living for their rapacious infants, wily bird hunters are sneaking up and taking pot shots at preoccupied families throughout the length and breadth of the land, not to mention Canada and Alaska.

High-powered binoculars and the last word in rapid action cameras have replaced the outmoded slingshot and popgun of nest-robbing bad boys in this modern hunting, however, with the result that hardly a bird is left today in the temperate and Arctic zones of North America whose nesting range is uncharted or whose nest and eggs have not been spotted at least once. There are plenty of interesting gaps to be filled in, of course, but the privacy of the family life of practically all the more important species is about as tenuous as that of a popular movie star or of Charles Lindbergh.

Conspicuous among recent birds that have had their private affairs dragged into the ornithological spotlight is a denizen of the reefs and shoals of the Pacific that has managed to hide his domestic life from impertinent scientific inquiry for nearly a hundred and fifty years. This is the surf-bird of the West Coast, that has occasionally been seen wintering as far south as the Straits of Magellan. It is little wonder he was so secretive, for when Dr. Joseph Dixon of the University of California finally ran him to earth on the slopes of Mt. McKinley, the highest mountain on the continent, and about the last place on earth where even a naturalist would expect to find the nest of a shore bird, he found that docile male meekly sitting on the eggs doing the lion's share of the incubating while friend wife spent her days in idle gossip with her emancipated female friends.

This rare bird is believed to have been first described by a member of one of Captain Cook's famous expeditions in Prince William Sound, Alaska, in 1789, the year of the adoption of the Constitution of the United States. Ever since that time hunting for a surf-bird's nest has been a favorite occupation of several generations of naturalists. As the name implies, they are shore birds, usually seen searching for feed far out on the reefs where the long Pacific swells break over the rocks into fine spray. Twice a year in their annual migration these little creatures traverse the Pacific coast line of two continents from the southern tip of South America to the northwestern corner of North America.

THIS BLUE GOOSE was raised at the National Zoological Park in Washington from an egg, but so far no nests of the species have been found in nature

In 1856 somebody took a specimen near San Francisco which was duly recorded in an ornithological collection, and about 1880 Dr. E. W. Nelson, chief of the U. S. Biological Survey, contributed more fragments to the story of the elusive bird by noting its occurrence in Alaska while making a scientific exploration of that then little known land. Subsequent explorers from time to time reported seeing the bird in the same territory and brought back tales from the Indians that "they nested back in the mountains in mosquito time." All this, slight though it was, gave weight to the idea that the breeding grounds were in Alaska. Eventually another member of the Biological Survey, studying Alaskan caribou herds, clinched the argument by the discovery of a young bird under a week old, well up above the timber line on McKinley Creek. It logically followed that the nest couldn't be very far away.

By this time the field had narrowed down by the process of elimination, since other investigators in Northern Canada and other parts of Alaska had failed to find any trace of the bird's nest.

When Dr. Dixon first became active in the quest, he decided to profit by the experience of the other naturalists that had crossed the surf-bird trail, and not look for it along the shore where one would naturally expect to find the nest of a seagoing bird. Piecing together the information about the few places where it had been seen and the many where it hadn't, he made up his mind to concentrate his attack on the high interior mountains of Alaska. So when he set out to find it on an expedition supported by the University of California and a private donor, accompanied by George M. Wright, he headed directly for the Mt. McKinley district.

The two men first sighted their quarry feeding well up on the mountainside at an elevation of about 4,000 feet, where little rivulets tumbled over the rocky cliffs from the snow melting overhead. It was evident that a striking change, unusual in birds, came about in the habits of the surf-birds as they moved from their winter to their summer range. Toward the end of the northward migration they abandon the seacoast and take up residence from 300 to 500 miles from salt water.

"This involves," Dr. Dixon pointed out, "a great altitudinal shift. Instead of living at sea level as they do at other seasons, during nesting time they are to be found on rocky, barren mountains high above the timber line. During the entire summer we never found these birds below 4,000 feet elevation. With this marked change in habitat has come a corresponding great change in food and habits. In summer, instead of living on sea food, the surf-bird turns to an insect diet, living then almost entirely on active insects which it captures by stealth or by fair chase in the open."

Yet in spite of this the character of their surroundings remains very much the same. Apparently they must have their rocks no matter what the change in altitude or bill of fare. Their favorite haunts, Dr. Dixon found, were on the rock slides of the mountain where perching places on broken points of rock were much the same as the reefs they inhabit in winter. This is the (*Turn to next page*)

The Father Bird Hatches the Egg—*Continued*

same sort of range, strangely enough, preferred by the Alaskan mountain sheep, and it proved useless, in fact, to look for them outside of sheep country.

Late one afternoon toward the end of May, the attention of Dr. Dixon's companion, Mr. Wright, was attracted by an inconspicuous bird, sneaking away hurriedly over the stony ground. He watched with his binoculars and marked the spot where it disappeared. He set out to investigate, but had about given up the job as useless when he almost stepped on a bird which flew up wildly, straight in his face. As it flew away he identified it unmistakably as a surf-bird. Glancing at his feet he saw that he was about to put his foot on one of the prize goals of American naturalists for the last hundred and forty years. There, resting in a little hollow in the ground and within a foot of a well worn high road of the mountain sheep, were a few scraps of lichens and moss surrounding four eggs. The nest of the surf-bird had been found at last.

The two men joyously gathered together notebooks, binoculars, and cameras, both still and movie, and prepared to camp behind a pile of rocks within close range of their find. Only a few photos could be taken in the fast fading light. Shortly after the long arctic twilight set in a cold rain began to fall, but the surf-bird merely fluffed up its feathers and the water ran down off its well-oiled waterproof into the absorbent moss around the nest. The shivering but enthusiastic observers were not so well protected, but they held their post till well on into the next day. What they found out there about the domestic vagaries of this rare species Dr. Dixon tells in his own words in his report to the Cooper Ornithological Club of California.

"When first frightened off the nest by Mr. Wright the previous afternoon, the bird which we later thought might have been the female, after 'exploding' ran away with wings half spread and the tail spread out fan-like and dragging on the ground. Now and then this bird would nestle down as though covering a nest. When about one hundred yards distant from the nest the bird began to wander about, pretending to feed. It exhibited no concern whatever when Mr. Wright returned to the nest and examined the eggs. It made no attempt to return to the nest even after the observer had retired to a distance and waited for a period of ten minutes, during which interval rain began to fall.

MT. McKINLEY, highest peak on the North American continent, where the surf-bird's nest was found by Dr. Dixon

"In marked contrast with this rather indifferent attitude, the bird which was watched on the nest for sixteen hours, behaved in an entirely different manner. This second bird, when forced off the nest, would fly directly up into the intruder's face, and then run off to one side, a distance of eight or ten feet, where it would perch on a rock, fluff out its feathers like a 'sitting' hen and utter a low plaintive call. The call would often be repeated two or three times after a slight pause of half a minute between calls. When we started after this bird it would lead us adroitly away from the nest; but if we stood still it would hustle directly back, even when we were standing only ten feet distant. In going on to the nest the bird was very careful not to step directly upon the eggs. It would trot up to within a foot or so of the eggs and then sneak cautiously down to the edge of the nest. Here it would stop, inspect the eggs, and reach out with its bill and turn the eggs around, keeping them little ends down. Following this inspection the bird fluffed out the feathers on its breast and sitting down gently on the edge of the nest, slid its body forward with great care until the eggs were completely covered.

"When frightened off the nest this surf-bird sometimes picked up small grass seeds and insects from bare places in the rocks, but during the sixteen hours that we watched, it never once left the nest voluntarily, and it always returned to the eggs within three or four minutes. The bird seemed to realize that the eggs would chill fatally if left uncovered for any length of time, and doubtless they would have done so, for my fingers after a while became so stiff and cold that I was unable to work the cameras.

"Only the one surf-bird put in an appearance at or near the nest during our entire stay of a day and a half. This bird, which was incubating, was at first presumed to be the female because of its evident anxiety for and care of the eggs. The bird was under close and constant observation from early morning until noon, when it was collected just as it left the nest. Imagine our surprise upon preparing the specimen to find that it was not a female at all but the male."

The scientists were unable to find any clue by which to detect the different sexes in the field except by the "maternal" behavior of the father bird. This state of affairs was later corroborated by the examination of specimens taken for scientific study. Five males, but none of the females, all had bare incubation patches or egg pockets worn in the feathers of the breast, indicating indubitably they were the ones who stayed home to care for the young ones while their modern mother gallivanted around amusing herself. . . . Likewise, all the males were thinner and weighed less than the female birds.

"Since we found breeding males feeding together in small companies of three and four, away from their nests, it is still possible that the female remains on the nest while the male is off feeding and vice versa," explained Dr. Dixon. The explorers had high hopes (*Turn to next page*)

Our Accelerated Economic Life

Economics

Speed and spread, rather than any fundamental change in economic methods, contain the secret of the new American prosperity that has arisen in the last seven years. Such is the finding of the most ambitious fact-finding and interpreting group that has ever considered economic conditions.

The Committee on Recent Economic Changes of the President's Conference on Unemployment has just made its report after fourteen months' consideration of the seven fat years, 1922-1929. Herbert Hoover, now President but at the beginning of the research Secretary of Commerce, headed the committee. Other members of the committee were: Walter F. Brown, Renick W. Dunlap, William Green, Julius Klein, John S. Lawrence, Max Mason, George McFadden, Adolph C. Miller, Lewis E. Pierson, John J. Raskob, Arch W. Shaw, Louis J. Taber, Daniel Willard, Clarence M. Woolley, Owen D. Young, and Edward Eyre Hunt. The committee had the fact-finding assistance of the National Bureau of Economic Research and the cooperation of a large number of governmental and private agencies.

Peering into the structure of business, labor and consumption today, the experts were able to see no structural change, no revolution in fundamentals, nothing basically new.

But the machine of American economic life has accelerated. Its tempo has quickened and methods and principles developed in previous years have achieved a breadth and scale that gives them new importance.

Power has flowed into industry, machinery has increased man's strength and skill so that industry's per capita productivity increased a third during the period, surplus incomes have become capital for new progress, and increased leisure has whetted the national appetite for more consumption.

The committee was struck by the outpouring of energy which piled up skyscrapers in scores of cities; knit the 48 states together with 20,000 miles of airways; moved each year over railways and waterways more than a billion and a half tons of freight; thronged the highways with 25,000,000 motor cars; carried electricity to 17,000,000 homes; sent each year 3,750,000 children to high school and more than 1,000,000 young men and women to college; and fed, clothed, housed and amused the 120,000,000 persons who occupy our twentieth of the habitable area of the earth.

Although the last seven years have been one of intense activity, the committee noted that this activity was "spotty" and summarized this finding as follows:

"While rayon manufacturers have worked at top speed, cotton mills have been on part time; while the silk-hosiery industry, the women's shoe trade, and the fur business have been active, there has been depression in the woolen and worsted industry; while dairying has been prosperous, grain growers have been depressed. Coal mining has been in difficulties, and classes of wholesalers and retailers have been under grave economic pressure. Progress has been made toward more stable employment in seasonal industries, yet 'technological' unemployment, resulting from the displacement of workers by improved machinery and methods, has attracted attention."

In the fortunate synchronizing of a high-wage level and a stationary cost of living, the committee sees a phenomenon that gives the last seven years a distinctive character. Prices have declined a tenth of a per cent. a year while wages increased 2.1 per cent. a year.

The primary needs, food, clothing and shelter, concern the American people less and less, the "high cost of living" and "full dinner pail" are forgotten, and the committee finds that "we wear less clothing, more rayons and silks, less cotton and wool."

"To maintain the dynamic equilibrium of recent years is, indeed, a problem of leadership which more and more demands deliberate public attention and control," the committee declared. "Research and study, the orderly classification of knowledge, joined to increasing skill, well may make complete control of the economic system a possibility. The problems are many and difficult, but the degree of progress in recent years inspires us with high hopes".

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The Father Bird Hatches the Egg—*Continued*

of finding more of the precious nests but were disappointed. Small groups of from two to seven birds were seen subsequently but even the likeliest territory failed to yield any more nests. Father Surf-Bird hides his shame with care and circumspection.

Two other birds first reported in 1789, like the model husband, have had their nesting sites rounded up within the last five or six years. These likewise are shore birds of the West Coast. The marbled murrelet was just run to cover in 1926 by a Canadian naturalist, S. J. Darcus, in the almost inaccessible cliff faces of the Queen Charlotte Islands, just off Vancouver. He found that these birds make burrows six feet or more into the surface of cliffs while the particular colony from which he secured specimen eggs was 200 feet above the sea. The inaccessible regions where the burrows are made probably accounts for their not having been found before. The Canadian ornithologist believes that most of the breeding colonies are located in the coast mountains of British Columbia, possibly in altitudes as high as 4,000 feet.

Only one nest of the third bird, rejoicing in the picturesque name of the wandering tatler, has thus far been found. It, too, was found in the Mount McKinley district near the gravel bars of a mountain stream by O. J. Murie of the U. S. Biological Survey.

About the most prominent member of the bird circles of North America whose nest has not been found in the natural state is the blue goose. This large and conspicuous bird, though comparatively abundant in its winter home on the Louisiana coast, kept its breeding range a secret from American ornithologists until two or three years ago, when, during the Putnam expedition into Baffin Land, young David Putnam shot and killed a young bird. It was obvious that the long-sought nesting grounds were not far off, and to the boy writer goes the credit for making this important find.

Though the nest and eggs of this interesting bird have not actually been found in the bird's own habitat, eggs laid by a pair in captivity at the National Zoological Park in Washington were successfully hatched and five young birds raised.

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Steamship Lanes Move North

Navigation

If you sail to Europe now, you will go over track B. This route, more northern than the A track that liners have been using for several months, is now in operation, according to an announcement from the U. S. Navy's Hydrographic Office. By fall, ships will take a still more northerly route.

Altogether there are three pairs of tracks for ships plying between New York and Europe. The southernmost one, track A, brings the ships to a point at 39 degrees 30 minutes north latitude and 47 degrees west longitude. From this point, the so-called "corner of the North Atlantic," the ships turn to the northeast, and proceed on their way. By so doing they avoid the ice on the Grand Banks, south of Newfoundland. During some winters the ocean is free enough from ice that this track never has to be used, but during the past few months the ships have been following it. The west-bound route is somewhat further north.

Beginning May 18, for east-bound ships, and May 25 for west-bound ships, track B is to be followed. When travelling eastwards, the corner is at 40 degrees 30 minutes north latitude, and westwards at 41 degrees and 30 minutes. A number of icebergs are over in the southern part of the Grand Banks, not far from the west-bound track, but the ice patrols, the U. S. C. G. Cutters *Tampa* and *Modoc,* are keeping track of them and issuing warnings by radio. By September 1, the ships will take a still more northerly route, known as track C, and will probably continue on it until about the end of January, when the ice again begins to come south.

Ships from Canadian ports to Europe are unable to avoid the ice as their course takes them south of Newfoundland, around Cape Race, and over the Grand Banks. To the east of the Banks there is now a large number of icebergs, so it is necessary for these ships to keep a careful watch. By July 1, however, these ships will take the most northern route, called Track G, which goes north of Newfoundland, through the Straits of Belle Isle.

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Airports On Buildings

Aviation

Landing "fields" for air mail and passenger planes located atop high buildings in congested areas are now receiving ground and wind tunnel tests, according to a report to the American Air Transport Association. The device consists of a platform 210 feet long and 60 feet wide. It revolves, allowing pilots to take off into the wind, and can be so maneuvered that a slant of 25 degrees is possible. For the take-off the platform is tilted, with the plane poised at the top and held in place by a new type anchor. Once released the plane slides down the incline, aided by the force of gravity. To accomplish a landing an aircraft lands at the foot of the incline and immediately is met by a series of spring cable retarders so designed that they reduce the speed of the plane without affording a tipping hazard. A huge reversible fan is also included which creates a gigantic suction of sufficient power to keep the plane from bounding away after landing.

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Ozone Due to Particles

Astronomy

Two layers of ozone in the earth's atmosphere, one due to ultraviolet light from the sun, the other due, perhaps, to particles or corpuscles shot at the earth from sunspots, were described at the meeting of the American Geophysical Union. In telling of his studies, Dr. F. E. Fowle, of the Smithsonian Institution, said that one of these layers of ozone, which is a form of oxygen, shows an annual period of change, depending on the position of the earth in its orbit. Probably, he thinks, it is due to ultraviolet light,

Unlike this layer, the second layer of ozone shows a close relationship to sunspots. When the sunspots are at their minimum number, it will probably be absent entirely, though the observations have not continued long enough to ascertain this. Dr. Fowle suggested that some emission of minute corpuscles from the sunspots might account for this layer.

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Examinees Ask Own Questions

Psychology

Prospective prohibition officers were allowed to ask their own questions when Uncle Sam examined them for enforcement jobs recently, it was revealed when Dr. L. J. O'Rourke, the Civil Service Commission's psychologist, allowed the Personnel Research Federation to publish details of the methods used in the tests.

But the government officials were not trying to make the examination easy or more routine. Quite the contrary. Progressive employers now turn the tables on the applicant, making him do the questioning, and the United States Civil Service Commission used this method to reveal judgment and resourcefulness in applicants for the position of prohibition officer. The tests were prepared under the direction of Dr. O'Rourke by Coleman F. Cook and others in the Research Division.

In this type of test the examiner directs the applicant to assume that he is already a prohibition officer and that the examiner is an informant who must be questioned regarding his knowledge of a law violation. The examiner has before him a list of facts which he, as informant, is supposed to know. These facts are given to the applicant in answer to his questions, but no information is volunteered. The examiner keeps a record of the different facts discovered by the applicant, and the applicant's rating is determined by the number and importance of the facts brought out. Here is what the "informant" said in presenting one problem:

"I'm leaving the city tomorrow for a few months' vacation, and I wouldn't like to get mixed up in any prosecution, but I do think that you prohibition officers ought to keep your eyes on Joe Kirsch, this man who was arrested last week for driving an automobile while intoxicated. He lives in the same neighborhood that I have been living in, and I've suspected for some time that he and his brother-in-law are violating the prohibition law."

The applicant, in order to make a high grade, must then ask definite, direct questions which will bring out the exact nature of the violation, who is connected with it, and where they may be found, where and how it occurs, and any other clues that may be in the possession of the "informant".

Dr. O'Rourke believes that the applicant who asks intelligent questions displays the judgment and resourcefulness which is desired by the Government in prohibition officers.

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CLASSICS OF SCIENCE:

The Earth and the Ancients

Astronomy—Philosophy

An object which, viewed through our frame of conventions, may seem to be behaving in a very special and remarkable way may, viewed according to another set of conventions, be doing nothing to excite particular comment.—EDDINGTON.

Here are two "frames of conventions" provided by the Greeks, showing the scientific and philosophical fetters from which Copernicus had to escape.

THE WORKS OF ARISTOTLE translated into English: DE CAELO, by J. L. Stocks, M. A., D. S. O. Oxford, 1922.

Let us first decide the question whether the earth moves or is at rest. For, as we said, there are some who made it one of the stars, and others who, setting it at the centre, suppose it to be 'rolled' and in motion about the pole as axis. That both views are untenable will be clear if we take as our starting point the fact that the earth's motion, whether the earth be at the centre or away from it, must needs be a constrained motion. It cannot be the movement of the earth itself. If it were, any portion of it would have this movement; but in fact every part moves in a straight line to the centre. Being, then, constrained and unnatural, the movement could not be eternal. But the order of the universe is eternal. Again, everything that moves with the circular movement, except the first sphere, is observed to be passed, and to move with more than one motion. The earth, then, also, whether it move about the centre or as stationary at it, must necessarily move with two motions. But if this were so, there would have to be passings and turnings of the fixed stars. Yet no such thing is observed. The same stars always rise and set in the same parts of the earth.

Further, the natural movement of the earth, part and whole alike, is to the centre of the whole—whence the fact that it is now actually situated at the centre—but it might be questioned, since both centres are the same, which centre it is that portions of earth and other heavy things move to. Is this their goal because it is the centre of the earth or because it is the centre of the whole? The goal, surely, must be the centre of the whole. For fire and other light things move to the extremity of the area which contains the centre. It happens, however, that the centre of the earth and of the whole is the same. Thus they do move to the centre of the earth, but accidentally, in virtue of the fact that the earth's centre lies at the centre of the whole. That the centre of the earth is the goal of their movement is indicated by the fact that heavy bodies moving towards the earth do not move parallel but so as to make equal angles, and thus to a single centre, that of the earth. It is clear, then, that the earth must be at the centre and immovable, not only for the reasons already given, but also because heavy bodies forcibly thrown quite straight upward return to the point from which they started, even if they are thrown to an infinite distance. From these considerations then it is clear that the earth does not move and does not lie elsewhere than at the centre.

From what we have said the explanation of the earth's immobility is also apparent. If it is the nature of earth, as observation shows, to move from any point to the centre, as of fire contrariwise to move from the centre to the extremity, it is impossible that any portion of earth should move away from the centre except by constraint. For a single thing has a single movement, and a simple thing a simple: contrary movements cannot belong to the same thing, and movement away from the centre is the contrary of movement to it. If then no portion of earth can move away from the centre, obviously still less can the earth as a whole so move. For it is the nature of the whole to move to the point to which the part naturally moves. Since, then, it would require a force greater than itself to move it, it must needs stay at the center. This view is further supported by the contributions of mathematicians to astronomy, since the observations made as the shapes change by which the order of the stars is determined, are fully accounted for on the hypothesis that the earth lies at the centre. Of the position of the earth and of the manner of its rest (*Turn to next page*)

(Reproduced from a painting by Howard Russell Butler, N. A., by courtesy of the American Museum of Natural History)

EARTH FROM THE MOON. A modern artist's conception of our planet from a detached viewpoint, which would have been quite impossible to even the wisest of the Greeks

The Earth and the Ancients—*Continued*

or movement, our discussion may here end.

Its shape must necessarily be spherical. For every portion of earth has weight until it reaches the centre, and the jostling of parts greater and smaller would bring about not a waved surface, but rather compression and convergence of part and part until the centre is reached. The process should be conceived by supposing the earth to come into being in the way that some of the natural philosophers describe. Only they attribute the downward movement to constraint, and it is better to keep to the truth and say that the reason of this motion is that a thing which possesses weight is naturally endowed with a centripetal movement. When the mixture, then, was merely potential, the things that were separated off moved similarly from every side towards the centre. Whether the parts which came together at the centre were distributed at the extremities evenly, or in some other way, makes no difference. If, on the one hand, there were a similar movement from each quarter of the extremity to the single centre, it is obvious that the resulting mass would be similar on every side. For if an equal amount is added on every side the extremity of the mass will be everywhere equidistant from its centre, i. e., the figure will be spherical. But neither will it in any way affect the argument if there is not a similar accession of concurrent fragments from every side. For the greater quantity, finding a lesser in front of it, must necessarily drive it on, both having an impulse whose goal is the centre, and the greater weight driving the lesser forward till this goal is reached. . . .

If the earth was generated, then, it must have been formed in this way, and so clearly its generation was spherical; and if it is ungenerated and has remained so always, its character must be that which the initial generation, if it had occurred, would have given it. But the spherical shape, necessitated by this argument, follows also from the fact that the motions of heavy bodies always make equal angles, and are not parallel. This would be the natural form of movement towards what is naturally spherical. Either then the earth is spherical or it is at least naturally spherical. And it is right to call anything that which nature intends it to be, and which belongs to it, rather than that which it is by constraint and contrary to nature. The evidence of the senses further corroborates this. How else would eclipses of the moon show segments shaped as we see them? As it is, the shapes which the moon itself each month shows are of every kind—straight, gibbous, and concave—but in eclipses the outline is always curved; and, since it is the interposition of the earth that makes the eclipse, the form of this line will be caused by the form of the earth's surface, which is therefore spherical. Again, our observations of the stars make it evident, not only that the earth is circular, but also that it is a circle of no great size. For quite a small change of position to south or north causes a manifest alteration of the horizon. There is much change, I mean, in the stars which are overhead, and the stars seen are different, as one moves northward or southward. Indeed there are some stars seen in Egypt and in the neighborhood of Cyprus which are not seen in the northerly regions; and stars, which in the north are never beyond the range of observation, in those regions rise and set. All of which goes to show not only that the earth is circular in shape, but also that it is a sphere of no great size; for otherwise the effect of so slight a change of place would not be so quickly apparent. Hence one should not be too sure of the incredibility of those who conceive that there is continuity between the parts about the pillars of Hercules and the parts about India, and that in this way the ocean is one. As further evidence in favour of this they quote the case of elephants, a species occurring in each of these extreme regions, suggesting that the common characteristic of these extremes is explained by their continuity. Also, those mathematicians who try to calculate the size of the earth's circumference arrive at the figure 400,000 stades. This indicates not only that the earth's mass is spherical in shape, but also that as compared with the stars it is not of great size.

THE REPUBLIC OF PLATO, by Ernest Barker. London, 1906.

And now that you agree with me, Socrates, I proceed in my commendation of astronomy, which you formerly reproved as superficial. For it is evident, I conceive, to every one, that this discipline compels the soul to look to that which is above, and from the things here conducts it thither. It is probable, said I, that it is evident to every one but to me. For to me it does not appear so. How then do you think of it? replied he. In the way it is now pursued by those who introduce it into philosophy, it entirely makes the soul to look downwards. How do you say? replied he. You seem to me, said I, to have formed with yourself no ignoble opinion of the discipline respecting things above, what it is: for you seem to think, that if any one contemplates the various bodies in the firmament, and, by earnestly looking up, apprehends every thing, you think that he has intelligence of these things; and does not merely see them with his eyes; and perhaps you judge right, and I foolishly. For I, on the other hand, am not able to conceive, that any other discipline can make the soul look upwards, but that which respects being, and the invisible; and if a man undertakes to learn any thing of sensible objects, whether he looks upwards with mouth gaping, or downwards with mouth shut, never shall I say that he learns; for I aver he has no science of these things, nor shall I say that his soul looks upwards, but downwards, even though he should float as he learns, lying on his back, either at land or at sea. I am punished, said he; for you have justly reproved me. But which was the proper way, said you, of learning astronomy different from the methods adopted at present, if they mean to learn it with advantage for the purposes we speak of? In this manner, said I, that those varied beauties in the heavens, as they are embroidered in a visible subject, be deemed the most beautiful and the most accurate of the kind, but far inferior to real beings: to those orbits in which real velocity, and real slowness, in true number, and in all true figures, are carried with respect to one another, and carry all things that are within them. Which things truly are to be comprehended by reason and the mind, but not by sight; or do you think they can? By no means, replied he. Is not then, said I, that artistic beauty in the heavens to be made use of as a paradigm for learning those real things, in the same manner as if one should meet with geometrical figures, drawn remarkably well and elaborately by Dædalus, or some other artist or painter? For a man who was skilled (*Turn to next page*)

Prosperity Due to Indian

Archaeology

The Indian laid the foundation of the economic greatness of the United States, Dr. Clark Wissler, professor of anthropology, Yale University, told the Conference on Midwestern Archaeology in St. Louis.

"It is not that we took merely the Indian's land," he said. "We acquired tobacco, maize, potatoes, peanuts, tomatoes, and some forty additional food plants. The yearly value of these products produced in the United States alone, when stated in dollars, is incomprehensibly large. We would have discovered tobacco in time, maybe, but it took the Indians centuries to develop the art and the plant. Maize, the economic backbone of agriculture in the Mississippi Valley, would have remained undiscovered for a long time at least.

"It was native Indian trade that enriched Europe and made the rapid development of our country possible. The Indian was a consumer of goods, eager to buy and to pay extravagantly in furs and other products. In truth, it may be said that the American Indian put the white man on the map."

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The Earth and the Ancients—*Continued*

in geometry, on seeing these, would truly think the workmanship most excellent, yet would esteem it ridiculous to consider these things seriously, as if from thence he were to learn the truth, as to what were in equal, in duplicate, or in any other proportion. Surely it would be ridiculous, replied he. And do not you then think, that he who is truly an astronomer will be affected in the same manner, when he looks up to the orbits of the planets? And that he will reckon that the heavens and all in them are indeed established by the artifices of the heavens, in the most beautiful manner possible for such works to be established; but would not he deem him absurd, who should imagine that this proportion of night, with day, and of both these to a month, and of a month to a year, and of other stars to such like things, and towards one another, existed always in the same manner, and in no way suffered any change, though they have a body, and are visible; and search by every method to apprehend the truth of these things? So it appears to me, replied he, whilst I am hearing you. Let us then make use of problems, said I, in the study of astronomy, as in geometry. And let us dismiss the heavenly bodies, if we intend truly to apprehend astronomy, and render profitable instead of unprofitable that part of the soul which is naturally wise.

Aristotle (384-322 B. C.) was born at Stagira, but became a pupil of Plato in Athens at 17. He remained with the older philosopher for the remaining 20 years of his life, teaching and developing a new experimental method of thought. Plato considered Aristotle his most brilliant student in spite of the difference in their method of thought. Upon Plato's death Aristotle left Athens. Three years' residence at the court of Hermias, tyrant of Atarneus, whose niece he married, ended with his patron's death. Eight years with Philip of Macedon as tutor to his son Alexander, afterward called the Great, terminated upon Philip's death. Aristotle then returned to Athens where he kept his famous school in the Lyceum and wrote his many books. The twelve years of Alexander's glory, when Aristotle was between the ages of 48 and 60, comprised the life of the Lyceum. Alexander's death made Athens unsafe for his old tutor, and the last two years of Aristotle's life were spent practically in exile in Chalcis.

Plato (427-347 B. C.) was in his youth a devoted friend of Socrates, whom he made one of the characters in his dialogues. Socrates was condemned to drink hemlock in 399, when Plato was 28 years old. During his later life, Plato taught the youth of Athens in the grove called Academus, and there in 367 Aristotle became one of his pupils. Case sums up the difference between the two thinkers: "Philosophically, Platonism is a philosophy of universal forms, Aristotelianism a philosophy of individual substances: practically, Plato makes us think first of the supernatural and the kingdom of heaven, Aristotle of the natural and the whole world."

Earth is the third planet from the sun, around which it revolves at a mean distance, "as every schoolboy knows" of 93 million miles. From its neighboring planets on either side, the features of its surface would probably be indistinguishable during a large part of the time on account of its atmosphere and frequent clouds. Under the best visibility, the works of man would be quite invisible to dwellers upon both Mars and Venus. Venus-ians, if their own atmosphere did not interfere, would get the best view of our planet, for the Earth and its Moon would appear to them as a great double planet, the most conspicuous object in the night sky. To the Martians, Earth would show phases as Venus and Mercury do to us, and the time of their occurrence would prevent their ever getting a good view of the whole surface of the Earth.

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Nature Ramblings

By Frank Thone

Marsh Marigold

Usually a little later in starting than its cousins, the buttercups, the marsh marigold makes up for lost time when it does come by bursting into a veritable bombshell of yellow light. All over the plashy edges of ponds, and marking ankle-wetting meadows with cushiony tufts of gold and glossy green, this is one of the most attractive of all our ornaments of wet places. It is, by the same token, one of the most aggravating of flowers if you want to pluck it, for it always grows just beyond arm's-length reach from the nearest solid ground, and you have to pay for a nosegay with a pair of wet feet.

In a world grown somewhat anxious about conserving wild flowers, it is a relief to find one that can take care of itself in this manner, and one, moreover, that can be gathered by the handful or even cropped by splashing cows, without apparent danger of depleting the visible supply. For the marsh marigold is a lusty and rank grower, and seems to be able to replace lost branches and leaves as nonchalantly as so much marsh grass.

If you have had the curiosity to gather some flowers of this plant, you will have a chance to read for yourself a lesson in that outdoor physiology of plants which the learned call ecology. You will see that each stem is hollow, or sometimes pierced lengthwise with several hollows. This is a common device among plants that grow with their heads in air and their roots in water or thoroughly soggy soil. Roots must have air to breathe, just as leaves do, and if the water excludes it, the next best thing is to bring it down through natural air-pipes which the plant can grow for itself.

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Whether tea is known as black or green depends on the method of preparing the leaves.

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The manual furnishes accurate diagnostic descriptions of the land and fresh water vertebrate animals of the United States, together with the analytical keys by means of which they can be readily identified.

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The economic relationships of the various forms of animal life to man are discussed.

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FIRST GLANCES AT NEW BOOKS

CONDUCTION OF ELECTRICITY THROUGH GASES—Sir J. J. Thomson and G. P. Thomson—*Macmillan* ($8.50). This book, by one of the greatest of English physicists and his son, represents the partial culmination of a work which began before the war. The first edition dates to 1903, the second to 1906. The third was begun some fifteen years ago, and now the first volume, dealing with general properties of ions, and ionisation by heat and light, has just appeared. So extensive has the subject grown that the single volumes of the first and second editions are no longer adequate. Naturally a work by two such eminent authorities is above criticism in the ordinary sense—it is one of those books that anyone at all interested in the subject will have to own.

Physics
Science News-Letter, June 1, 1929

THE PAGEANT OF THE STARS—Willem J. Luyten—*Doubleday, Doran* ($2.50). A Harvard astronomer, now in South Africa at the Bloemfontein station, is the author of this excellent popular work on astronomy. The author has a particularly lucid style, as shown, for instance, in his account of the stellar encounter that produced the solar system. As an astronomer who has achieved prominence, he is entirely accurate, yet he does not let this fact interfere with the clarity and ease of the presentation. In short, it is a book which we highly recommend.

Astronomy
Science News-Letter, June 1, 1929

TELEVISION—H. H. Sheldon and E. N. Grisewood—*Van Nostrand* ($2.25). All the most important methods of visual radio, which includes still picture transmission, radio-movies and television, are here discussed and explained. Methods of the Westinghouse Co., the A. T. & T. Co., C. Francis Jenkins, J. F. Baird, E. F. W. Alexanderson and others are included.

Television
Science News-Letter, June 1, 1929

THE A B C OF PHYSICS—Jay L. B. Taylor—*Vanguard* (50c). A little, and inexpensive, primer of physical science that covers its more important aspects.

Physics
Science News-Letter, June 1, 1929

FIELD BOOK OF COMMON ROCKS AND MINERALS—Frederic Brewster Loomis—*Putnams'* ($3.50). This is the fourth impression of a book in the publisher's nature field books. The clear descriptions, the numerous illustrations, many in color, all make the book an excellent one to use as an aid to identify the minerals one meets with in travelling about the country.

Mineralogy
Science News-Letter, June 1, 1929

LABORATORY INVESTIGATION OF ORES—Ernest E. Fairbanks—*McGraw-Hill* ($3.50). Chemists and assayers are the conventional evaluators of the riches within the rocks. Microscope, X-ray, and the other tools of the metallographer are equally helpful to the economic geologist. This symposium brings together the best practice and the latest knowledge of this field.

Geology
Science News-Letter, June 1, 1929

TOPOGRAPHIC AND GEOLOGIC ATLAS OF PENNSYLVANIA: NO. 5, NEWCASTLE QUADRANGLE, F. W. DEWOLF; NO. 27, PITTSBURGH QUADRANGLE, Meredith E. Johnson—*Division of Documents, Harrisburg, Pa.* ($1 each). The Commonwealth of Pennsylvania has set the pace for other states in this topographic and geologic atlas which will, eventually, cover the entire state. The various parts contain sets of maps of the quadrangle showing not only the topographical features but the geology, natural resources, and similar details of the region. The several hundred pages of text in each fully supplement these maps.

Geology
Science News-Letter, June 1, 1929

FIVE HUNDRED TESTS OF VARIOUS COALS IN HOUSE-HEATING BOILERS—P. Nicholls, S. B. Flagg, and C. E. Augustine—*U. S. Government Printing Office* (15c). The tables of this Bureau of Mines technical report contain data on various kinds of coal which would result in financial saving to the careful householders if they would take the pains to study them.

Engineering
Science News-Letter, June 1, 1929

THE MIDDLEMAN—J. R. Sprague—*Morrow* ($2.) An easy, narrative style makes the reader forget that this is, basically, a book on an important phase of economics.

Economics
Science News-Letter, June 1, 1929

DEVILS, DRUGS AND DOCTORS—Howard W. Haggard—*Harpers* ($5). The unusual arrangement of material adds considerably to the pleasure in reading this entertaining book, which is a history of medicine, although it bears scant resemblance to a formal history. The story, written for the layman, is told largely through colorful incidents. The contents are arranged according to subject matter rather than in chronological order. The illustrations, of which there are 150, are particularly fine, including many choice old woodcuts of Holbein and some caricatures of Rowlandson and Hogarth.

Medical History
Science News-Letter, June 1, 1929

HANDBOOK OF HISTOLOGY—A. McL. Watson—*Wood* ($3.75). A very concise textbook of histology (the study of the anatomy of the tissues of the body) for medical students, with all original illustrations. The book should be valuable to students for reference and also to laboratory technicians without medical school education who would appreciate a brief explanation of the tissues they help to prepare for examination.

Histology
Science News-Letter, June 1, 1929

PSYCHIATRY IN INDUSTRY—V. V. Anderson—*Harper* ($4). Why men and women do poor work, why they are dissatisfied, nervous, or worried, these problems have been studied by Dr. Anderson through long experience as consultant in a large department store. His book tells about the prevalence of such conditions, and how the psychiatrist goes about the task of placing the right person in the right job and of aiding employees to attain the best possible degree of efficiency and contentment.

Psychiatry
Science News-Letter, June 1, 1929

LIST OF THE BOOKS, BULLETINS, JOURNAL CONTRIBUTIONS, AND PATENTS BY MEMBERS OF MELLON INSTITUTE OF INDUSTRIAL RESEARCH DURING THE CALENDAR YEAR 1928—*Mellon Institute of Industrial Research, Pittsburgh.* This publication lists 1 book, 14 bulletins, 15 research reports, 104 other scientific and technical papers, and 25 United States patents, and will be sent free to any chemists, librarians or teachers who ask for it.

Bibliography
Science News-Letter, June 1, 1929

First Glances at New Books—*Continued*

THE HUMAN MECHANISM—Theodore Hough, William T. Sedgwick and J. A. Waddell—*Ginn* ($3). The book is designed for students. As a result, the first part, on physiology, is too technical for most laymen. However, Part II on hygiene and sanitation contains sound, sane advice with much valuable information on matters of both public and private health, and can be highly recommended to all. The book is clearly illustrated. Dr. Waddell, a former professor at the University of Virginia, Department of Medicine, and former epidemiologist of the Virginia State Board of Health, has edited this second revision.

Physiology—Hygiene
Science News-Letter, June 1, 1929

PROGRESSIVE RELAXATION — Edmund Jacobson—*University of Chicago Press* ($5). Rest, which is becoming increasingly popular in the treatment of various diseases, fails in its therapeutic purpose if it does not embody complete relaxation. Dr. Jacobson believes. His book discusses relaxation in its various stages and in physical and psychological aspects, and gives directions for achieving it. Intended primarily for physicians, parts of it are sufficiently non-technical for the intelligent patient to read. Explanatory pictures and a copious bibliography enhance the value of the book, which is one of the University of Chicago monographs in medicine.

Medicine—Psychology
Science News-Letter, June 1, 1929

THE SCHOOL AND THE WORKING CHILD—Mary A. Clapp and Mabel A. Strong—*Massachusetts Child Labor Committee* ($1). Social workers, educators and the like will find much of interest in this discussion of the Massachusetts laws governing the school child at work, their enforcement and interpretation.

Education
Science News-Letter, June 1, 1929

TEACHING HEALTH IN FARGO—Maud A. Brown — *Commonwealth Fund* ($1.50). Miss Brown, who was director of health education during the Commonwealth Fund's health demonstration activities in Fargo, N. D., gives a detailed account of her methods in teaching health as part of the demonstration. The methods are still in use in the schools, although the Commonwealth Fund's demonstration has been concluded.

Education
Science News-Letter, June 1, 1929

THE A B C OF CHEMISTRY—Newell R. Tripp—*Vanguard Press* (50c). If one wishes to know what chemistry is about, this is a good book to read It is a stepping-stone to more detailed treatises.

Chemistry
Science News-Letter, June 1, 1929

LIFE OF LAVOISIER—Mary Louise Foster—*Smith College* ($1). Lavoisier's life is a part of the history of chemistry. There has been heretofore no detailed account in English of the life of this great man.

Chemistry
Science News-Letter, June 1, 1929

FIX IT YOURSELF—Arthur Wakeling—*Popular Science Publishing Co.* ($1). When the business man about the house on Saturday afternoon or Sunday finds time hanging heavy on his hands he can consult this compendium and guide to keeping his home in repair.

Home Economics
Science News-Letter, June 1, 1929

AGRICULTURAL SURVEY OF EUROPE—FRANCE—Louis G. Michael—*U. S. Government Printing Office* (25c). That all of France is not Paris is shown in this searching and important U. S. Department of Agriculture study of French agriculture.

Agriculture
Science News-Letter, June 1, 1929

TUBERCULOSIS AND HOW TO COMBAT IT — Francis M. Pottenger — *Mosby* ($2). In simple language Dr. Pottenger explains tuberculosis and its treatment. The book is intended for patients and their families and should be most helpful to them and their physicians, for whose advice it is a supplement but not a substitute.

Medicine
Science News-Letter, June 1, 1929

THE FACTS OF MODERN MEDICINE — Francis W. Palfrey — *Appleton* ($5). This book tells you what you have always wanted to know about yourself: Just how you are built, how you function and what happens when you get sick. Dr. Palfrey has presented in delightfully readable style the knowledge of the modern physician. The layman who reads it will be much better able to cooperate with his physician in getting well and staying well, because he will understand the facts on which the physician's advice is based.

Medicine
Science News-Letter, June 1, 1929

LIFT UP YOUR EYES—*Ford Motor Company*, Dearborn, Mich. A beautiful portfolio composed of the seventeen full-page illustrated advertisements published in various magazines to awaken public interest in the opportunities of aviation traffic for goods and passengers.

Aviation
Science News-Letter, June 1, 1929

AIRCRAFT YEAR BOOK 1929—*Aeronautical Chamber of Commerce of America* ($5.25). As the annual encyclopedia and directory of a fast growing science and industry, this book renews its usefulness for reference and inspiration.

Aeronautics
Science News-Letter, June 1, 1929

COLOUR PHOTOGRAPHY — Owen Wheeler—*Pitman* ($3.75). A sound and complete treatise on this most interesting aspect of photography. The new British method of making color snapshots with the aid of a tripack of novel design is explained in a supplement.

Photography
Science News-Letter, June 1, 1929

GEOLOGIC STORY OF THE GENESEE VALLEY AND WESTERN NEW YORK—Herman LeRoy Fairchild — *H. L. Fairchild* ($2.50). The emeritus professor of geology at the University of Rochester believes that the people of his state should become acquainted with the rocks, water courses, prehistoric plants and animals, and other geologic features of their home territory. Since the book deals with the spectacular and much visited Niagara region, is attractively written, and well illustrated, it should appeal to a wider public than that of New York.

Geology
Science News-Letter, June 1, 1929

IT'S NOT OUR FAULT — Alfred Lawrence Hall-Quest — *Liveright* ($2.50). A survey of evil, past views and present conditions. The author comes to the conclusion finally that "it is not our individual fault, but it is our fault as members of society", which seems to be drawing the line rather finely.

Sociology
Science News-Letter, June 1, 1929

INTRODUCTION TO AGRICULTURAL ECONOMICS—Fred R. Yoder—*Thomas Y. Crowell Company* ($3). With farm relief and tariff on agricultural products now before Congress, this is not only a reference book but a timely publication.

Economics
Science News-Letter, June 1, 1929